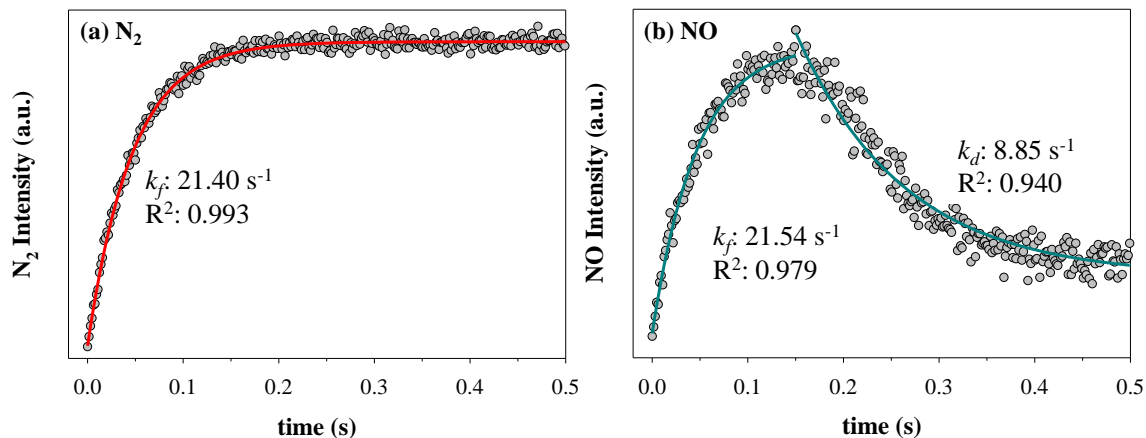


## Supporting Information

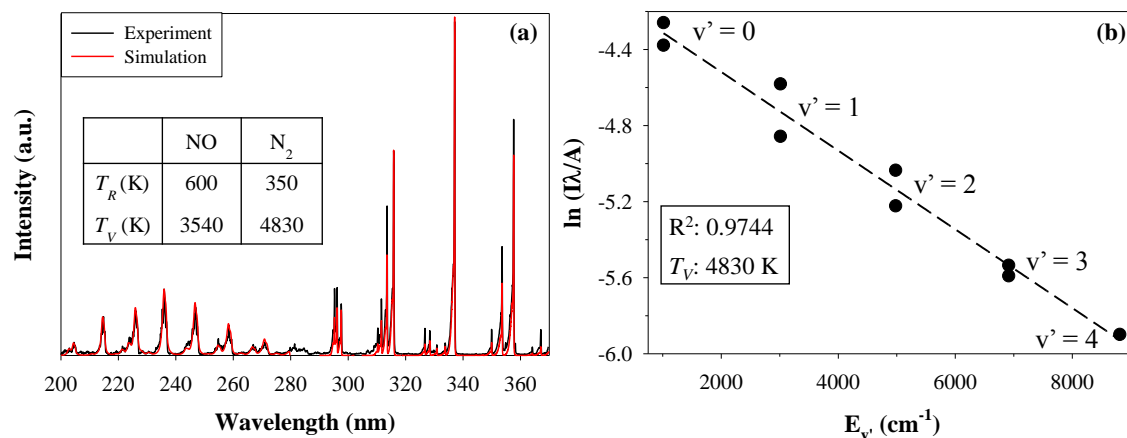
### Efforts Towards Unraveling Plasma Assisted Catalysis: Determination of Kinetics and Molecular Temperatures Within N<sub>2</sub>O Discharges

Angela R. Hanna and Ellen R. Fisher,\*

Department of Chemistry, Colorado State University, Fort Collins, CO 80524-1872

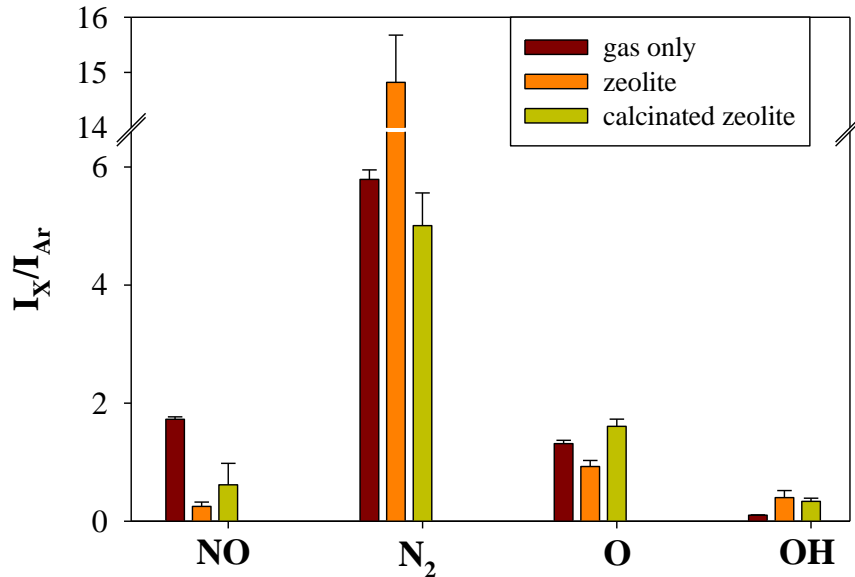


**Figure S1.** Intensity from (a) N<sub>2</sub> and (b) NO emission as a function of time, where first order exponentials were used to determine rate constants ( $P = 150 \text{ W}$ , Pt powder present).

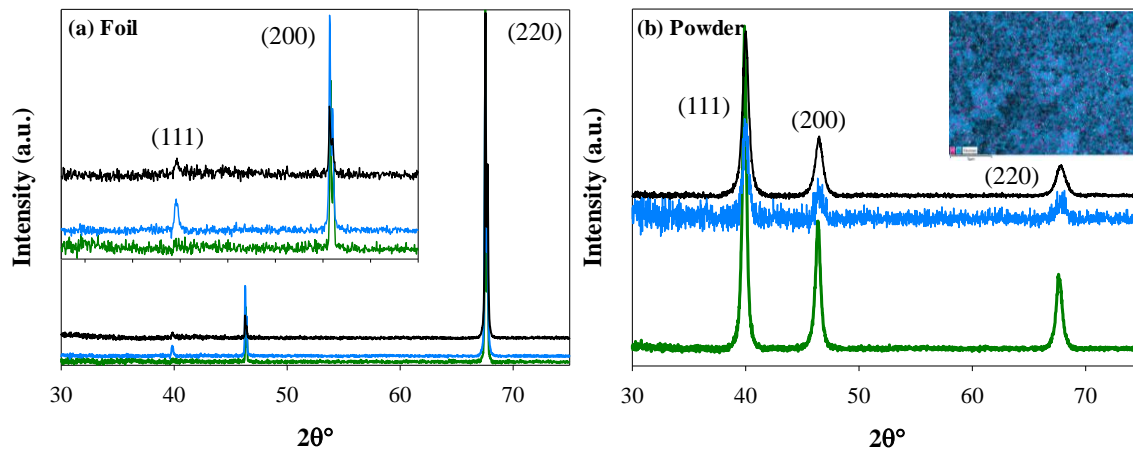


**Figure S2.** (a) Representative N<sub>2</sub>O emission spectrum (100 mTorr, 125 W, zeolite pellet present), with both NO and N<sub>2</sub> bands fit. Internal temperatures are reported within inset table. (b) Boltzmann plot corresponding to the determination of N<sub>2</sub>  $T_V$  (K) at the above conditions.

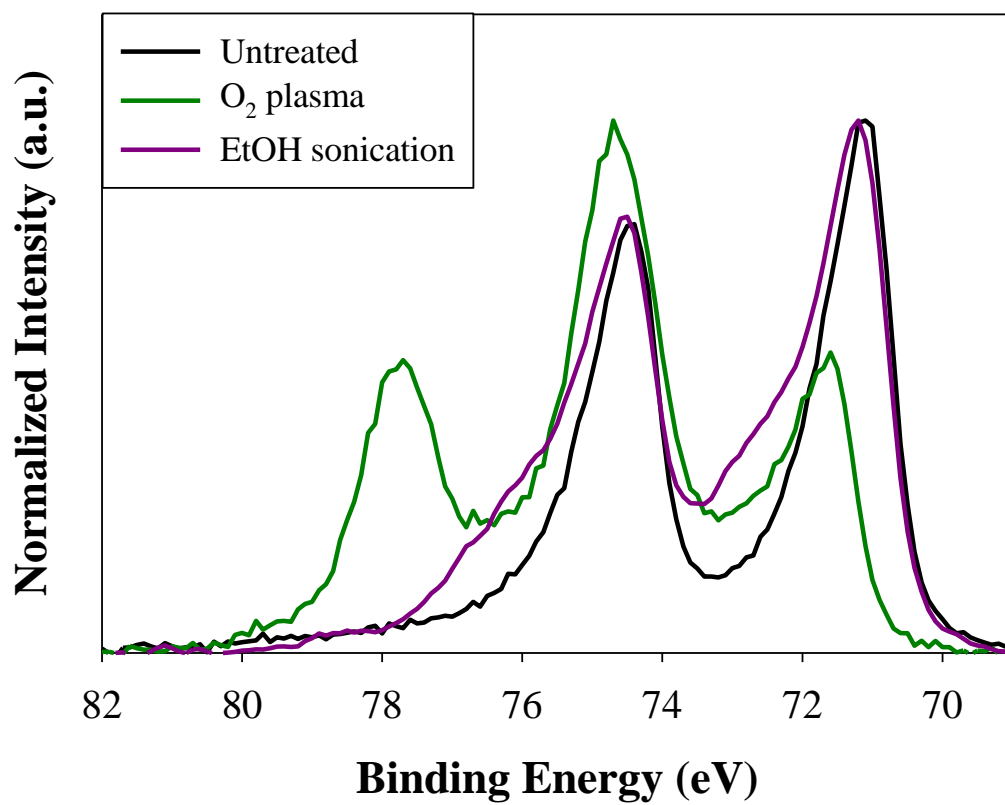
\*Author to whom correspondence should be addressed: Ellen.Fisher@colostate.edu



**Figure S3.** Relative species densities within a 100 mTorr, 175 W N<sub>2</sub>O plasma with no catalyst (red), pressed zeolite pellets (orange), and oven calcinated zeolites (yellow).



**Figure S4.** PXRD patterns for Pt (a) foil and (b) powder substrates: untreated (black trace) and N<sub>2</sub>O treated at  $p = 100$  mTorr,  $P = 175$  W,  $t = 10$  minutes (green trace). Inset in panel (a) highlights the (111) and (200) peaks in the Pt foil diffraction patterns, where the green trace was multiplied by 10 to better compare diffraction intensities. Inset EDS image in panel (b) corresponds to the N<sub>2</sub>O treated Pt powder ( $p = 100$  mTorr,  $P = 175$  W,  $t = 10$  minutes), blue and pink pixels represent Pt and O, respectively.

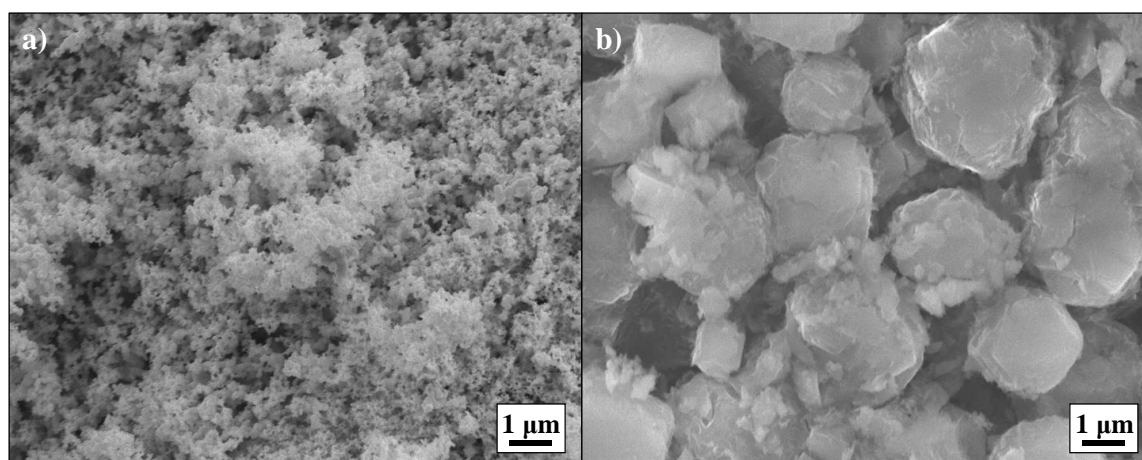


**Figure S5.** High-resolution Pt<sub>4f</sub> XPS spectra for Pt foil cleaned via O<sub>2</sub> plasma treatment ( $p = 100$  mTorr,  $P = 100$  W,  $t = 5$  min) and EtOH sonication (30 min).

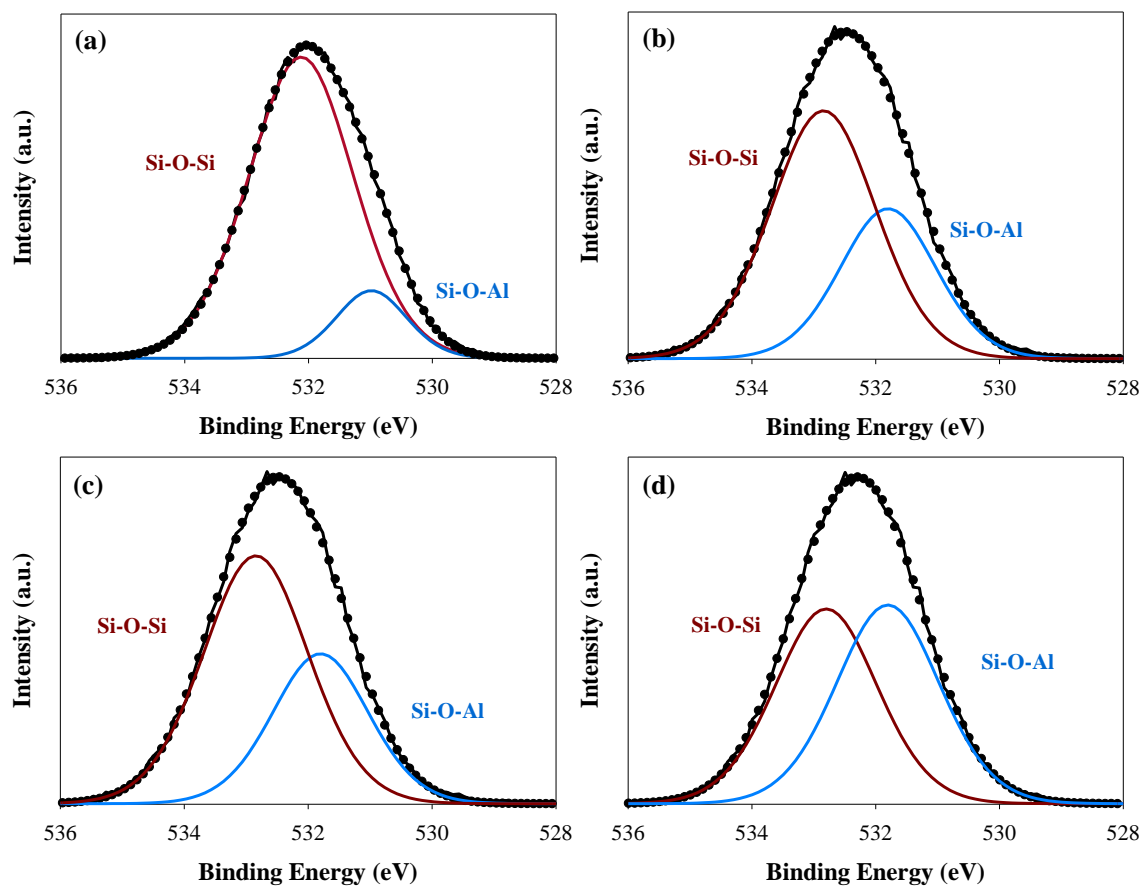
**Table S1.** XPS atomic composition for Pt powder fabrication strategies<sup>a</sup>

	drop cast		carbon tape		
	EtOH	Hexane	UT	UV-light	oven
Pt (%)	47.3 (17.5)	22.3 (.5)	53.4 (12.2)	44.2 (1.5)	60.1 (3.5)
O (%)	44.7 (12.3)	39.2 (1.1)	37.0 (4.1)	27.8 (3.4)	29.7 (2.8)
C (%)	8.0 (8.8)	33.5 (7.6)	9.5 (13.6)	28.0 (4.5)	10.2 (1.0)
Si (%)	--	5.0 (10.0)	--	--	--

<sup>a</sup>Values in parenthesis represent standard deviation from the mean (n = 6)



**Figure S6.** SEM images of N<sub>2</sub>O treated (100 mTorr, 175 W, 10 minutes) (a) Pt powder and (b) zeolite pellet, collected at 5000x magnification.



**Figure S7.** High-resolution  $O_{1s}$  XPS spectra for zeolite pellets without (a,c) and with (b,d) oven calcination pre-treatment, before (a,b) and after (c,d)  $N_2O$  plasma exposure ( $p = 100$  mTorr,  $P = 175$  W,  $t = 10$  min).